

another rent in an opposite direction at an angle of exactly 32° . The brick shaft of the mill stands by itself, and is about 40 feet high. The upper part, ten feet from the top, is broken right through, evidently by the swaying motion, and is twisted round on the lower part one inch and a half towards the south-east. The size of the chimney at this part is 3 feet 9 inches square.

In view of Mr. Topley's suggestion that the earthquake may have some connection with the underlying ridge of Palæozoic rocks, it would be interesting to know if any shocks were felt in the Boulonnais and the Ardennes.

J. E. TAYLOR
Ipswich Museum

At the Cross Farm, East Mersea, on April 25, I was shown in the garden two places where water, it was said, spouted up shortly after the shock on the 22nd. They were about ten yards apart on a freshly dug piece of ground on a slight slope, and the woman who lived in the house close by informed me that after the shock she had observed water spouting out from them, and that it continued to do so until after her dinner, which was at one o'clock, when it ceased. There was enough water she said to cause a small stream to run down from each place towards her house, where they formed a puddle; her husband tasted the water and told her it was brackish. There was still evidence of the truth of this statement: the earth at each spot was damp, as was also a small channel which the water had made running down the slope. It appeared as if a small underground water-pipe had burst and the water had been forced above the surface. Cross Farm, I believe, is about a quarter of a mile from the sea, and perhaps twenty feet above its level.

EDWARD NEWTON
Lowestoft, May 5

THIS village lies partly on the lowest beds of the Chalk, and partly on the Gault; it is between N. lat. $51^\circ 49'$ and $51^\circ 50'$, and W. long. $0^\circ 40'$ and $0^\circ 41'$. The shock was felt at the church, and at two cottages where are invalids in bed. The church is on rising ground at the edge of the chalk platform which lies below the Chilterns, some two miles away from them. I was on the scaffolding erected for repairs to the church. At a little past nine—it could hardly have been later, I think, than 9.15, if so late—I felt the church give what seemed like a fierce shudder. This seemed to begin on the east, rather to north, and travelled westwards nearly. By shudder I mean that a sort of vibration began, which almost instantly increased in intensity, reached a climax, and then rapidly decreased and died away. It seemed to me to begin slightly north of east, because I remember feeling (for what reason I can hardly say) that the cause was hidden from me behind the east end of the church. I was on the south side, some eighteen feet from the south-east corner. A moment after a whirlwind followed, which began, as I find, near the top of the slope north-east of the church, and followed the churchyard wall which bends round the churchyard to south-west. In a cottage on the junction of the Chalk and Gault (or very near the junction), according to the result of inquiries I have made of an invalid there, the pictures on a wall lying north-west and south-east waved from and to the wall, but seemed also to move along it somewhat, i.e. north-west and south-east. Flower-pots on a table rocked in a direction almost east and west, and a window facing the south-east shook; her bed also, lying north-west and south-east, waved, and seemed as if giving way. This took place, she says, a little after nine. In a cottage on the Gault where another invalid was lying, a window facing south-west rattled, a picture shook on the wall on which it is fixed, and the bed, lying south-east and north-west, also waved. This was, she thought, at nine, but the time must have been later. She noticed that the wind was still. No noise was heard except the clatter caused by the rattling of the buildings; but at a mill on the Icknield Way, near Tring, lying at nearly lat. $51^\circ 48'$, and long. $0^\circ 40'$, a rumbling was heard.

FREDERICK W. RAGG
Masworth Vicarage, Tring, May 6

Black Rain

THE following paragraph from the *Field* of May 3 will probably interest those of your readers who have seen my note in the last number of NATURE (p. 6):—

"Black Rain.—Yesterday afternoon (April 28) a violent thunderstorm raged over the district between Church Stretton and Much Wenlock. Torrents of rain fell, seemingly a mixture

of ink and water in equal proportions. One old man here says he never saw anything like it but once. I certainly never saw such a coloured rain, and I intend to have a bottle of it analysed. Even this afternoon the little brooks are quite black, and the ruts in the roads look as if ink and water had been poured into them.—Rev. R. I. BUDDICOMBE, Ticklerton, Church Stretton."

An analysis of the rain which fell at Stonyhurst showed that the impurity was almost entirely carbon.

S. J. PERRY
Stonyhurst Observatory, Whalley, May 4

The Remarkable Sunsets

BECAUSE of the volcanic hypothesis that has been proposed to account for the red sunsets of the past fall and winter, other instances where similar phenomena have been seen after like eruptions are of interest.

Graham's Island, which arose off Sicily in 1831, attracted attention from July 19 to August 16, but was most active on August 7, according to the account given by John Davy in the *Philosophical Transactions* for 1832. The same writer says (p. 252):—"In the month of August a singular appearance was witnessed in the heavens, many evenings successively, both here and in Sicily. Soon after sunset the western sky became of a dark, lurid red, which extended almost to the zenith, and continued gradually diminishing in extent and intensity even beyond the limit of twilight."

A few days after this eruption, August 11 and 12, on the clearing away of a hurricane, the sun appeared blue at the Bermuda Islands (*Amer. Journ. Sci.* xl. p. 323); on August 13, 14, 15, at Mobile, in the southern part of the United States, the rays of the sun were pale blue or violet, varying to sea green (*Amer. Journ. Sci.* xxi. p. 198).

In the month of October the sunsets were prominent enough in the vicinity of Washington to attract popular inquiry. At Alexandria, Virginia, October 12, the heavens continued to reflect a very red light for a long time after the sun had set. October 13, at midday, the sun had a silvery appearance, and its rays gave a ghastly appearance to the countenances of persons. Between 3 and 4 p.m. it appeared greenish blue (*Niles' Register*, October 1831).

L. G. CARPENTER
State Agricultural College, Lansing, Michigan, U.S.A.,
April 17

It may interest readers of NATURE to learn that on the occasion of a rain-storm at 5 p.m. on the 26th ult. at Crowle, an agricultural village a few miles eastward of this city, the rain-water was so greatly discoloured and loaded with an ash-like matter as to present, until after subsidence, a deep black hue, when caught in vessels placed for the purpose. Again, on Saturday last, the 3rd inst., on the occurrence in this city of rain-storms during a half gale from the north-west, there remained after the storms, on the panes of windows exposed to the north-west, a considerable film of dust which had fallen with the rain. While writing it may be mentioned that the phenomenon described as red sunrises and sunsets has prevailed here, before and after sunset, ever since November 9 last; of late, in gradually decreasing tone and variety of colour, and extent of sky area. The coloration at this date is of a russet hue, and there is a steely glare.

J. LL. BOZWARD
Worcester, May 5

Rotating Thermometers

IN reference to the Froude thermometer, to which attention is drawn in your last number (p. 6) by Mr. Hazen, I feel confident that if its merits were better known it would be universally employed, not only as insuring among all observers absolute uniformity in the record of the temperature of the air, but as affording the only satisfactory means of determining the degree of saturation by means of the wet and dry bulb. Nothing is more perplexing to the meteorologist than the selection of his screen and of an appropriate site. The system of whirling a thermometer rapidly through the air effectually dwarfs all external influences from the rapidity with which renewed particles constantly impinge on the bulb, and it is well known that in the case of the wet bulb the indication is greatly affected by the presence or absence of wind. I found this to be practically the only means of determining the temperature and humidity in a steamer at sea. The only objection was the inconvenience and risk of whirling small thermometers on a string,

and the difficulty of reading without affecting their record ; but this I completely got over as explained in my "Visit to South America," 1878, by using a simple whirling table, on which the thermometers were fixed, the reading being effected by bringing them in succession under a plate of glass covering part of the circumference of the table. Nothing can exceed the simplicity of such an arrangement, which is almost independent of position, and with *small* thermometers affords a uniformity and accuracy impossible of attainment with a fixed thermometer, as it becomes a repeating instrument by a few extra turns of the table, thus insuring freedom from error of observation. I have used this system for many years with most satisfactory results.

EDWIN CLARK

Science and the Public Service

WHILST sincerely regretting the new scheme of openly cutting down the science marks in the army examinations, I think it is not so much the low maximum of marks supposed to be attainable which is discouraging the science subjects, as the low marks actually given at all Government examinations (excepting the Indian Woods and Forests) to any one who is so unwise as to take up natural science. To take, as an example, the Indian Civil Service marks of last year. While in French and German, each of which is a 500 subject, more than 30 per cent. of the candidates obtained over 200 marks ; in chemistry, which is also a 500 subject, only two out of thirty-two, or 6 per cent., scored over 200. The marks in the other subjects included in the fatal column of natural science are equally low. Now I do not think that any one will maintain that science is not properly taught at Clifton, Dulwich, &c., yet in French and German a boy has every chance of obtaining 100 marks more than in chemistry (the highest marks last year were—chemistry 229, French 325, German 347). Two possibilities present themselves : either the clever boys will not take up science subjects at all owing to the low marks persistently given, or the examiners expect more chemical knowledge from a boy of eighteen (who must take mathematics or classics, English, &c., in addition to chemistry) than he can possibly acquire. I trust that examiners may be induced to seriously consider the last possibility.

F. C. S.

THE ROYAL CORPS OF NAVAL CONSTRUCTORS

BY an Order in Council of August last this corps was established ; an Admiralty Circular of November last published the details of the new arrangements ; and the result of the first examination for the grade of "Students in Naval Construction" has recently been announced. An important change has thus been made in the entry, training, and promotion of the professional officers upon whom devolve the responsibilities connected with the design and construction of ships for the Royal Navy ; yet little public interest has been evinced. There can be no dispute, of course, as to the great importance attaching to the maintenance in the highest state of efficiency of the constructive department of the navy. Shipbuilding is making such rapid strides that all who have to take part in its developments, whether for war or for commerce, require a highly scientific as well as a thoroughly practical education, if they desire to keep in the forefront of progress. And for modern war-ships with their high speeds, heavy burdens of armour and armament, and liability to damage in action, specially difficult problems continually present themselves, the solution of which is only possible by means of scientific procedure. Recognising these facts, it may be well to make a brief statement respecting the new Constructive Corps, and to indicate the manner in which its creation may be beneficial not merely to the public service but to the mercantile marine.

It is only proper to remark at the outset that the Lords Commissioners of the Admiralty have hitherto been the chief patrons of the scientific education of shipbuilders in England ; and to their generosity has been due the existence of the only establishments in which the higher train-

ing of naval architects was provided for. Early in the present century (1811) the first School of Naval Architecture was established in Portsmouth Dockyard, and continued at work for more than twenty years. It was established in consequence of the absolute necessity for opposing to the well-trained French naval architects men of equal education and ability, who could not be found at that time in our naval service. Ship-designing was clearly in a very inferior position here, when no shame was felt in building servile imitations of vessels captured from the French. In 1832 this school was abolished, and for sixteen years there was no training establishment of the kind open for English students. But during that interval men educated at Portsmouth occupied important positions both in the Royal Naval service and in private establishments, helping to maintain our national reputation. In 1848 a second school was opened at Portsmouth, on a much more modest scale, and destined to have a shorter life, for it lasted only five years. That brief period sufficed, however, to produce a number of men still holding some of the highest positions in the profession. Another interval of ten years elapsed, and then the Royal School of Naval Architecture was opened at South Kensington, the Admiralty giving it large support, although it aimed at educating other than Admiralty students. Since 1864 there has been no interruption in the good work, although in 1873 the establishment at Kensington was broken up, and the Admiralty section of it transferred to the Royal Naval College at Greenwich. There, as at Kensington, all comers are welcomed if they possess sufficient preliminary training, and private English students, as well as foreigners, have opportunities for instruction afforded them as good as those which the Admiralty provide for their own students. By the munificence of Mrs. John Elder the University of Glasgow has had a Professorship of Naval Architecture recently established, and the classes will, it is understood, commence work this year. But up to the present time the Royal Naval College affords unrivalled opportunities for instruction, and may challenge comparison with any similar institution in Europe.

By means of the very excellent training schools in the Royal dockyards, and the large field of selection from among the apprentices, the Admiralty have been able to secure a continuous supply of well-prepared students for the higher training at Kensington or Greenwich ; and thus have obtained the educated naval architects required for the public service. Nor is this all that has been done. A very considerable number of the trained men have passed from Admiralty employment into private establishments, where they have done and are doing good work.

It may be asked, in view of these results, why change a system which has worked so well? The answer is twofold. First, there were grave objections to the continuance of the restrictions imposed by the regulations for first entry into the service. Second, there was not proper recognition of the special training which a student had received when he passed out into actual work, nor any guarantee of a subsequent career. These points require brief explanation.

Although the Admiralty so fully recognised the value of scientific training for its naval architects, and made provision for it, yet for half a century they maintained regulations which necessitated the first entry into the service being made either as an apprentice or as a working man. A few exceptions may be quoted : but the general rule was as stated. The result of this arrangement was that, with few exceptions, candidates for entry came from the working classes ; and there was no attraction into the service of the sons of persons in good social positions, such as very commonly become pupils of civil or mechanical engineers. This was obviously a matter which required alteration. The competition for entry was absolutely free, no doubt ; but it was surrounded by conditions which